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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,045	01/20/2004	Doron Adler	C2C-2.004.DIV	7115

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EXAMINER

LAVIN, CHRISTOPHER L

ART UNIT	PAPER NUMBER
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2624

DATE MAILED: 08/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/759,045

Applicant(s)

ADLER, DORON

Examiner

Christopher L. Lavin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 41-75 is/are pending in the application.
- 4a) Of the above claim(s) 41-66 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 67-75 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/3/05; 1/24/06
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claims 67 – 74 are objected to because of the following informalities: In claim 67 the preamble calls for interpolating “at least one” of the longitudinal and axial axes. Later in the same preamble the claim states, “based on image data from both said longitudinal and axial axes”. These two statements conflict one is an “or” statement and the other is an “and” statement. For the purposes of this action the examiner will assume that the applicant meant to go with the “or” statement. Appropriate correction is required.

Priority

2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Israel on 04/10/00. It is noted, however, that applicant has not filed a certified copy of the foreign patent application as required by 35 U.S.C. 119(b).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. Claims 67 – 71, 74 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Wada (5,343,254) and Aghajan (5,311,600).

In regards to claim 67, A method for reconstructing images by interpolating image data along at least one of the longitudinal and axial axes of a flexible catheter with a distal end inserted into a blood vessel and thereby reaching remote places in the vasculature or other organs, based on image data from both said longitudinal and axial axes (The examiner would first like to note that this is the preamble, and much of the content in this statement does will not receive any weight in the examination of the claims. However, to speed prosecution the examiner is providing Wada, which in the background (col. 1, lines 12 – 56) clearly discloses that the Wada's invention is intended for endoscopes that by their very nature will take images of at least one of the longitudinal and axial axes, to speed prosecution.), comprising: i. [Off-line image training initialization], and; ii. Real-time image data interpolation (col. 9, lines 3 – 23).

Wada discloses a method where an endoscope image is analyzed to detect edges; this information is then used to correct the dynamic range for display on conventional monitors. Wada discloses an edge detection circuit,

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however, Wada does not use a neural network based edge detector, which is what the applicant is implying with the requirement of “off-line image training”. To speed prosecution the examiner is providing Aghjan (col. 3, line 58 – col. 4, line 25; col. 5, lines 25 – 33) as a teaching that edge detection can be implemented using Neural Networks. Aghjan uses a neural network (which has a preliminary training step) to create an edge map, which is then used to find the edges.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use a neural network to find edges as taught by Aghjan in the method disclosed by Wada. By using a neural network to find an edge map Wada can more accurately detect the edges using the edge detection circuit disclosed. If edges are detected more accurately the overall dynamic range compression will be better, thus leading to better image quality for the user.

In regards to claim 68, A method of reconstructing images according to claim 67 wherein said off-line image training initialization comprises: i. Training image construction (Both Wada and Aghjan take in an initial image.); ii. Reconstruction of a lower resolution new image from said training image (Aghjan: col. 3, line 58 – col. 4, line 24; col. 5, lines 49 – 58); iii. Finding edge directions of said lower resolution image, and (Wada: col. 9, lines 3 – 23); iv. Training a neural network to obtain a set of filters (The specification defines a filter on page 20 as a weight, the examiner will use this definition. Aghjan: col. 3, line 58 – col. 4, line 24).

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In regards to claim 69, A method of reconstructing images according to claim 68 wherein said training image is clipped and rotated to obtain robust edges in each one of a plurality of directions (Aghjan: col. 3, line 58 – col. 4, line 24; col. 5, lines 49 – 58: The image sections fed to the Neural Network are clipped and rotated as they are small sections of single columns. It is also noted that Aghjan teaches (col. 6, lines 18 – 44) that an image can be rotated several times to find all of the edges, this operation could be performed after the edge mapping disclosed by Aghjan.).

In regards to claim 70, A method of reconstructing images according to claim 67 comprising executing local contrast enhancement following said image data interpolation (Wada: col. 9, lines 23 – 30; col. 7, lines 11 – 13: Wada is correcting the dynamic range, which is a local contrast enhancement step.).

In regards to claim 71, A method according to claim 70 wherein said local contrast enhancement comprises: i. Calculating the average intensity of said real time image, yielding an intensity image (Wada: col. 3, line 63 – col. 4, line 16: The analog image is taken in and converted into an intensity image); ii. Generating a first image by correcting the intensity of said intensity image (Wada: col. 3, line 63 – col. 4, line 16: $\log Y$); iii. Calculating a local contrast image (col. 4, line 20 – col. 5, line 32); iv. Generating a second image by enhancing said local contrast image, and (col. 4, line 20 – col. 5, line 32: $\log Y'$); v. summing said first image and said local contrast image to generate an output image (col. 4, line 20 – col. 5, line 32: $\log \beta Y'^a - \log Y$).

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In regards to claim 74, A method according to claim 67 wherein said real-time data interpolation comprises: i. Finding edge directions of each pixel, and (Wada: col. 9, lines 3 – 23); interpolating data using an appropriate direction filter from a set of direction filters (Wada: col. 9, lines 3 – 30: Again filters are being taken to mean weights as taught by the specification on page 20.).

In regards to claim 75, A method according to claim 74 comprising generating said set of direction filters in said off-line image training (Aghjan: col. 5, lines 25 – 33).

6. Claims 72 and 73 rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Wada and Aghjan as applied to claim 71 above, and further in view of Lewis (4,555,768).

In regards to claims 72 and 73, the combination of Wada and Aghjan teaches that a log conversion is applied to the images, however, the combination does not teach how this conversion is performed. Lewis teaches (col. 2, lines 7 – 23) that one way to perform a log conversion is to use a lookup table which stores log values.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use a log lookup table to calculate (as taught by Lewis) to calculate the log values of the images in the method disclosed by the combination of Wada and Aghjan. A lookup table is very fast and is less complicated than an actual mathematical operation.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher L. Lavin whose telephone number is 571-272-7392. The examiner can normally be reached on M - F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh M. Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christopher Lavin


BRIAN WERNER
PRIMARY EXAMINER